

RCRA Facility Investigation – Remedial Investigation/  
Corrective Measures Study – Feasibility Study Report  
for the Rocky Flats Environmental Technology Site

Section 9.0  
Summary and Conclusions of the Remedial Investigation

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## TABLE OF CONTENTS

9.0	SUMMARY AND CONCLUSIONS OF THE REMEDIAL INVESTIGATION.....	9-1
9.1	Components of the Remedial Investigation.....	9-2
9.2	Soil and Sediment .....	9-4
	9.2.1 Surface Soil and Surface Sediment.....	9-4
	9.2.2 Subsurface Soil .....	9-5
9.3	Groundwater .....	9-6
9.4	Surface Water.....	9-9
9.5	Air .....	9-10
9.6	Reconfiguration and Renaming of the Operable Units.....	9-10
9.7	Conclusions.....	9-11
9.8	References.....	9-12

## LIST OF TABLES

Table 9.1	Summary of the RFI/RI
Table 9.2	Summary of Historical IHSSs, PACs, and PICs in the Peripheral OU
Table 9.3	Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU

## LIST OF FIGURES

Figure 9.1	Rocky Flats Environmental Technology Site Exposure Units
Figure 9.2	Rocky Flats Environmental Technology Site Aquatic Exposure Units
Figure 9.3	Subsurface Soil Sampling Locations Where Volatilization PRGs Were Exceeded
Figure 9.4	UHSU Groundwater Monitoring Locations Where Composite MCLs Were Exceeded
Figure 9.5	Groundwater Sampling Locations Where Volatilization PRGs Were Exceeded
Figure 9.6	UHSU Groundwater Monitoring Locations Where Composite MCLs Were Exceeded
Figure 9.7	Subsurface Soil Sampling Locations Where Volatilization PRGs Were Exceeded
Figure 9.8	Groundwater Sampling Locations Where Volatilization PRGs Were Exceeded
Figure 9.9	Historical IHSSs, PACS, and PICs in the Peripheral OU
Figure 9.10	Plutonium-239/240 Activity in Surface Soil

## **9.0 SUMMARY AND CONCLUSIONS OF THE REMEDIAL INVESTIGATION**

This section summarizes the Remedial Investigation (RI) for the Rocky Flats Environmental Technology Site (RFETS or site), based on the nature and extent of contamination evaluations, results of the Comprehensive Risk Assessment (CRA), and the contaminant fate and transport evaluation, and presents conclusions of the RI.

The nature and extent of contamination evaluations considered the following environmental media: soil, groundwater, surface water, sediment, and air. These evaluations were conducted to show the types of analytes remaining in the environmental media and their extent at RFETS following the Rocky Flats Cleanup Agreement (RFCA) accelerated actions.

The CRA consists of two parts: a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA). A risk assessment is an evaluation of potential adverse impacts to human health and the environment that may exist from contaminated environmental media associated with site-related activities. The CRA was designed to provide information to decision makers to help determine the final remedy that is adequately protective of human health and the environment.

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the U.S. Environmental Protection Agency (EPA) considers environmental concentrations corresponding to a  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$  cancer risk range and a total noncancer hazard index (HI) less than or equal to 1 to be adequately protective of human health (NCP 1990; EPA 1989, respectively).

The Colorado Department of Public Health and the Environment (CDPHE) defines acceptable human health risk as a lifetime excess cancer risk less than  $1 \times 10^{-6}$  from exposure to carcinogenic compounds and/or a hazard quotient (HQ) less than 1.0 for noncarcinogenic compounds (CDPHE 1994).

Because the CRA does not evaluate an unrestricted scenario, but instead evaluated potential risk to the anticipated future user (wildlife refuge worker [WRW] and wildlife refuge visitor [WRV]), the assumptions used in the CRA human health calculations, including the assumptions used in calculating WRW preliminary remediation goals (PRGs), may need to be embodied in an institutional control.

The overall risk management goal identified for use in the ERA, as stated in the Final CRA Work Plan and Methodology (CRA Methodology) (DOE 2005a), is the following:

*Site conditions due to residual contamination should not represent significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination.*

The ERA was designed and implemented to determine whether site conditions meet the defined goal.

The contaminant fate and transport evaluation used information about the site physical characteristics, contaminant source characteristics, and contaminant distribution across the site to develop a conceptual understanding of the dominant transport processes that affect the migration of different contaminants in various RFETS environmental media. The primary focus, consistent with the RFCA objectives, is evaluating the potential for contaminants from any medium to impact surface water quality. Evaluation of a contaminant's fate and transport is based upon two criteria: (1) does a complete migration pathway exist based on an evaluation of contaminant transport in each environmental medium, and (2) is there a potential impact to surface water quality based on an evaluation of data at representative groundwater and surface water locations in the creek drainages.

## **9.1 Components of the Remedial Investigation**

The RI consists of (1) the evaluation of the nature and extent of contamination after completion of RFCA accelerated actions, (2) the CRA for environmental media, and (3) the fate and transport evaluation at RFETS. Table 9.1 presents a summary of the RI and identifies the specific media to be evaluated in the Feasibility Study (FS) (Sections 10.0 and 11.0 of this report).

The first column in Table 9.1 presents the nature and extent of analytes of interest (AOIs) by medium as identified in Sections 3.0 through 6.0. The purpose of identifying AOIs is to focus the nature and extent evaluation on constituents that have been detected at concentrations that may contribute to the risk to future receptors and to show overall spatial and temporal trends of those constituents on a sitewide basis.

Soil and sediment AOIs are those analytes that are present with greater than a 1 percent frequency of detection above WRW PRGs. WRW PRGs are calculated values equivalent to an HQ of 0.1 or risk of  $1 \times 10^{-6}$ . The more conservative of the two values is established as the PRG. These risk-based numbers are used for these media because no standards exist for soil or sediment, and the exposure assumptions used for the risk-based levels (specifically, WRW assumptions) are consistent with the future land use. Groundwater AOIs are those analytes with concentrations greater than surface water standards and that form contiguous, mappable plumes. Surface water standards are promulgated in the Colorado Water Quality Control Commission (CWQCC) regulations. Comparison to surface water standards is consistent with RFCA objectives of protecting surface water quality. Surface water AOIs are those analytes that are present with greater than a 1 percent frequency of detection above surface water standards for samples collected since January 1, 2000. Air AOIs are those analytes that represent an ongoing source of potential emissions in the future. Details on the screening methodology, PRGs or standards used in the screen, and results are found in Sections 3.0 through 6.0.

Column 2 in Table 9.1 presents the results of the CRA, which are summarized in Section 7.0. The details of the CRA are found in Appendix A of this RI/FS Report. The CRA complies with the regulatory agency-approved CRA Methodology (DOE 2005a). A summary of the CRA Methodology is in Appendix A, Volume 2. For purposes of the CRA, RFETS is divided into 12 Exposure Units (EUs) for assessing potential risks to human and terrestrial ecological receptors, and 7 Aquatic EUs (AEUs) for assessing potential risks to aquatic ecological receptors.<sup>1</sup> The EU and AEU locations are shown on Figure 9.1 and Figure 9.2, respectively.

Contaminants of concern (COCs) and ecological contaminants of concern (ECOCs) are identified by the CRA on an EU or AEU basis using the processes outlined in the CRA Methodology. Quantitative risk characterization is performed for those EUs and AEUs where COCs and/or ECOCs are identified. COCs are quantitatively evaluated in the HHRA for the WRW and WRV consistent with the anticipated future land use of RFETS as a wildlife refuge. A variety of ecological receptors of concern for the ERA were identified in the CRA Methodology including the Preble's meadow jumping mouse (PMJM), a federally listed threatened species present at RFETS.

The third column in Table 9.1 presents (1) the results of the evaluation of fate and transport of the AOIs for each medium identified through the nature and extent evaluation process in Sections 3.0 through 6.0 and (2) the COCs that contribute risk greater than  $1 \times 10^{-6}$  to a WRW or an HI greater than 1. Section 8.0 evaluates the environmental pathways and physical and chemical processes by which the AOIs, COCs, and ECOCs are transported and distributed in the RFETS environment, and evaluates whether those analytes may impact surface water quality. Air AOIs are evaluated based on the potential airborne radiological contaminant exposure received by a human receptor as measured against the EPA 10-millirem (mrem) annual benchmark level for the airborne pathway.

Together, the nature and extent of contamination evaluations, results of the CRA, and contaminant fate and transport information are used to assess the extent to which residual contamination may pose a threat to human health and the environment. Column 4 in Table 9.1 presents the overall results of the RI, and Column 5 identifies the specific areas of contaminated media to be evaluated in the FS (Sections 10.0 and 11.0).

Sections 9.2, 9.3, 9.4, and 9.5 describe the key results of the RI by environmental medium.

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<sup>1</sup> CDPHE guidance requires evaluation of contaminant concentrations on a Solid Waste Management Unit (SWMN) or release site basis. As discussed in Section 1.2.3, this was implemented at RFETS on an Individual Hazardous Substance Site (IHSS)-by-IHSS basis during the accelerated action process. As noted in Section 1.4.3, by addressing cumulative impacts from multiple release sites, the CRA's EU approach complements, but does not supplant, the Colorado Hazardous Waste Act's (CHWA's) emphasis on individual release sites. Because the parties had anticipated using institutional controls consistent with the anticipated future use of the site, CDPHE determined that a post-remediation analysis of residual risk on a release site basis was not necessary.

## 9.2 Soil and Sediment

### 9.2.1 Surface Soil and Surface Sediment

Fourteen surface soil AOIs were identified in Section 3.0. The surface soil AOIs are aluminum, arsenic, chromium (total), vanadium, PCB-1254, PCB-1260, 2,3,7,8-tetrachlorodibenzodioxin (TCDD) toxicity equivalency (TEQ), benzo(a)pyrene, dibenz(a,h)anthracene, americium-241, plutonium-239/240, uranium-233/234, uranium-235, and uranium-238. Even though sediment was evaluated in Section 5.0, the sediment results are included with soil because the HHRA portion of the CRA combined sediment with soil for the risk evaluations and the AOIs have similar transport mechanisms. Five sediment AOIs were identified in Section 5.0: benzo(a)pyrene, arsenic, chromium, americium-241, and plutonium-239/240.

One COC was identified in Section 7.0, which requires further evaluation. The surface soil COC for the Wind Blown Area EU (WBEU) is plutonium-239/240. The cancer risk estimates for the WBEU are estimated for exposure to plutonium ( $2 \times 10^{-6}$ ). The dose estimate for plutonium for the WRW is 0.3 millirem per year (mrem/yr) and for the WRV child is 0.2 mrem/yr, based on upper-bound average concentrations across the WBEU. No surface soil/surface sediment ECOCs were identified in the CRA. The overall conclusions from the ERA indicate there is no significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination. However, additional sediment and ecological monitoring will be evaluated in the FS.

Contaminant fate and transport (Section 8.0) evaluated the environmental pathways and physical and chemical processes by which the AOIs, COCs, and ECOCs are transported and distributed in the RFETS environment and whether the AOIs, COCs, or ECOCs may impact surface water quality. Complete pathways from surface soil/surface sediment to surface water were identified in Section 8.0 for two surface soil analytes: americium-241 and plutonium-239/240 (see Sections 8.3.3.1 and 8.3.5.1 and Tables 8.4 and 8.5). These two analytes have been observed intermittently above the surface water standard, which is higher than background or the practical quantitation limit (PQL) at representative surface water locations upstream of the terminal ponds in North Walnut Creek, South Walnut Creek, and the South Interceptor Ditch (SID)/Woman Creek drainage. Removal of impervious areas has decreased runoff volumes and peak discharge rates resulting in reduced soil erosion and the associated particulate transport of americium-241 and plutonium-239/240 from surface soil/surface sediment with its potential impacts on surface water quality. Consequently, if residual soil contamination is disturbed, it could migrate to surface water via erosion which could result in some surface water sample results above surface water standards at some surface water monitoring locations.

For surface soil/surface sediment analytes, the most current surface water data show concentrations below the highest of the surface water standard, background, or PQL at representative surface water locations downstream of the terminal ponds in North Walnut Creek, South Walnut Creek, and the SID/Woman Creek drainage.

Of the 14 different AOIs or COCs identified in surface soil/surface sediment, only 2 have complete pathways to surface water: americium-241 and plutonium-239/240. In the past, these two analytes have intermittently been measured above their surface water standard upstream of the terminal ponds.

### 9.2.2 Subsurface Soil

Fourteen subsurface soil AOIs were identified in Section 3.0: chromium (total), lead, PCB-1260, benzo(a)pyrene, 1,1,2,2-tetrachloroethane, carbon tetrachloride, chloroform, methylene chloride, tetrachloroethene, trichloroethene, americium-241, plutonium-239/240, uranium-235, and uranium-238. No subsurface soil COCs or ECOCs were identified in the CRA.

As stated earlier, contaminant fate and transport (Section 8.0) evaluated the environmental pathways and physical and chemical processes by which the AOIs are transported and distributed in the RFETS environment and whether the AOIs may impact surface water quality. Complete pathways from subsurface soil to surface water (via groundwater) were identified in Section 8.0 for five subsurface soil analytes, all of which are volatile organic compounds (VOCs). These analytes include carbon tetrachloride, chloroform, methylene chloride, tetrachloroethene, and trichloroethene (see Section 8.4.2.2 and Table 8.6). Subsurface soil analytes with complete pathways from subsurface soil to surface water (via groundwater) are associated with one or more groundwater areas, as addressed in the groundwater section below. Consequently, the subsurface soil analytes with complete pathways from subsurface soil to surface water (via groundwater) may be above the surface water standards (which are higher than background or the PQLs) at one or more Sentinel wells.<sup>2</sup>

For the subsurface AOIs, the most current data for those analytes measured in groundwater show concentrations below the highest of the surface water standard, background, or PQL at all Area of Concern (AOC) wells.

The indoor air pathway was evaluated on a sitewide basis in the CRA (see Appendix A, Volume 2). Volatile chemicals have been detected in the subsurface in some subsurface soil sampling locations of the site. If a building is erected over these subsurface soil sampling locations in the future, the volatile chemicals may migrate through the building foundation indoors and be subsequently inhaled by people. In the CRA, the evaluation for the indoor air inhalation pathway was performed by comparing the maximum detected concentration (MDC) of VOCs in subsurface soil and subsurface sediment to PRGs for indoor air. Where there are no exceedances of the volatilization PRGs, the indoor air inhalation pathway is assumed to be insignificant (Figure 9.3). Where there are exceedances of the volatilization PRGs, the potential for an exposure resulting in unacceptable risk to the WRW is assumed to exist and these locations require further evaluation in the FS.

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<sup>2</sup> Sentinel wells are wells that are typically located near downgradient plume edges, in drainages, and downgradient of existing groundwater treatment systems. These wells will be monitored to identify changes in groundwater quality.

Contaminated subsurface features remain in the subsurface (Section 2.0) in the former Industrial Area (IA). These features were not evaluated in the CRA because they are not an environmental medium and because of the assumption in the CRA that there is no exposure pathway for a WRW given that he or she will not be digging below 3 feet (ft). Consequently, the FS will need to embody this CRA assumption in an institutional control.

In conclusion, the five VOCs identified as having complete pathways from subsurface soil to surface water via groundwater have been measured below the highest of surface water standard, background, or PQL in the AOC wells and above the value in one or more Sentinel wells. In addition, there are areas where exceedances of volatilization PRGs in subsurface soil indicate a potential indoor air risk.

### 9.3 Groundwater

Nineteen upper hydrostratigraphic unit (UHSU) groundwater AOIs were identified in Section 4.0, as analytes detected in wells that represent contiguous, mappable plumes above surface water standards. The UHSU groundwater AOIs are uranium (sum of isotopes), chloromethane, benzene, 1,2-dichloroethane, vinyl chloride, cis-1,2-dichloroethene, methylene chloride, 1,1-dichloroethene, chloroform, carbon tetrachloride, tetrachloroethene, trichloroethene, dissolved and total nickel, dissolved arsenic, total chromium, nitrate/nitrite (as N), fluoride, and sulfate.

Shallow (UHSU) groundwater impacted by site activities discharges to surface water upgradient of the site boundary. This impacted groundwater emanates from the former industrial area and discharges to surface water in the drainages upgradient of the terminal ponds. Per the Fiscal Year (FY) 2005 Integrated Monitoring Plan (IMP) (K-H 2005a), potential impacts from shallow (UHSU) groundwater to surface water quality are measured at Sentinel and AOC wells. Sentinel wells are wells that are typically located near downgradient contaminant plume edges, in drainages, and downgradient of existing groundwater treatment systems. These wells are monitored to determine changes in groundwater quality. AOC wells are wells that are within a drainage and downgradient of a contaminant plume or group of contaminant plumes. These wells are monitored to determine whether the plume(s) may be discharging to surface water.

Contaminant fate and transport (Section 8.0) evaluated the environmental pathways and physical and chemical processes by which the AOIs are transported and distributed in the RFETS environment and whether the AOIs may impact surface water quality. Complete pathways from shallow groundwater to surface water were identified for 10 groundwater AOIs: uranium (sum of isotopes uranium-233/234, uranium-235, and uranium-238), cis-1,2-dichloroethene, carbon tetrachloride, tetrachloroethene, trichloroethene, chloroform, methylene chloride, nitrate/nitrite (as N), fluoride, and sulfate (see section 8.4.4 and Table 8.11). Groundwater AOIs with complete subsurface pathways from groundwater to surface water are primarily associated with five groundwater areas. The five groundwater areas with the potential to impact surface water quality (complete

pathway from groundwater to surface water) were identified because some groundwater analytes are above surface water standards at one or more Sentinel wells. These areas are:

- North of former Building 771 (north of the Carbon Tetrachloride Plume) – Trichloroethene may exceed the surface water standards.
- Historical East Trenches area (downgradient portion between South Walnut Creek and the existing East Trenches Plume Treatment System [ETPTS]) – Tetrachloroethene, trichloroethene, carbon tetrachloride, methylene chloride, chloroform, and cis-1,2-dichloroethene may exceed the surface water standards.
- Historical Mound Site/Oil Burn Pit No. 2 area (downgradient portion between South Walnut Creek and the Mound Site Plume Treatment System [MSPTS]) – Chloroform, trichloroethene, tetrachloroethene, 1,2-dichloroethene, cis-1,2-dichloroethene, 1,1-dichloroethene, and methylene chloride may exceed the surface water standards between South Walnut Creek and the MSPTS. Carbon tetrachloride, chloroform, methylene chloride, tetrachloroethene, and sulfate may exceed the surface water standards between historical Oil Burn Pit No. 2 and the MSPTS. (Contaminated groundwater from historical Oil Burn Pit No. 2 is treated at the MSPTS.)
- Historical 903 Pad/Ryan's Pit area – Tetrachloroethene, trichloroethene, carbon tetrachloride, chloroform, and cis-1,2-dichloroethene may exceed the surface water standards downgradient of the historical 903 Pad, while carbon tetrachloride, chloroform, and trichloroethene may exceed the surface water standards downgradient of historical Ryan's Pit.
- Historical Solar Evaporation Ponds (SEP) area and 700 Area Northeast area (downgradient portion of plumes between Solar Ponds Plume Treatment System [SPPTS] and North Walnut Creek) – Nitrate and uranium at the historical SEP and nitrate from the 700 Area Northeast plume may exceed the surface water standards. (Contaminated groundwater from the 700 Area Northeast plume is treated at the SPPTS.)

Based on data and numerical transport modeling results, it is likely that residual VOC sources and associated downgradient groundwater concentrations will persist in the environment for decades to hundreds of years even with the source removals that were implemented as accelerated actions (EPA 2003). As part of the Groundwater Interim Measure/Interim Remedial Action (IM/IRA) (DOE 2005b), an alternatives analysis was conducted to evaluate other accelerated action strategies that were feasible and practicable based on the type of residual contamination in these five areas and environmental conditions (for example, distance between the existing groundwater treatment systems and adjacent stream channels). The selected alternatives were conducted as one-time enhancements to previously implemented remedial actions. The selected enhancements are detailed in the Groundwater IM/IRA and were completed in 2005. The enhancements were intended to reduce the migration of contaminated groundwater that could impact surface water quality. They are not expected to eliminate groundwater contamination in the short term, but to have a positive long-term impact on

groundwater and surface water quality. At this time, no other additional actions can reasonably be taken.

The following actions have been implemented in accordance with approved RFCA decision documents to treat contaminated groundwater that could potentially impact surface water quality. The actions are:

- Post-closure care and monitoring of the Present Landfill and continued operation and maintenance (O&M) of the Present Landfill seep treatment system; and
- O&M of three groundwater treatment systems and performance monitoring (ETPTS, MSPTS, and SPPTS).

Continued operation of these four systems serves to protect surface water quality over short- and intermediate-term periods by removing contaminant loading to surface water. This protection also serves to meet long-term goals for returning groundwater to its beneficial use of surface water protection.

For the groundwater AOIs, the most current data for those analytes measured in shallow groundwater show concentrations below the highest of the surface water standard, background, or PQL at all AOC wells with the exception of well 10594 (located downgradient of Pond A-1 in North Walnut Creek with sulfate results above background, which is higher than the surface water standard or PQL, in samples collected in 1995 and 1996).

Groundwater contamination above maximum contaminant levels (MCLs) exists in some sampling locations at RFETS (Figure 9.4).

The indoor air pathway for groundwater was evaluated on a sitewide basis in the CRA (see Appendix A, Volume 2). Volatile chemicals have been detected in the subsurface in some groundwater sampling locations of the site. If a building is erected over these groundwater sampling locations in the future, the volatile chemicals may migrate through the building foundation indoors and be subsequently inhaled by people. In the CRA, the evaluation for the indoor air inhalation pathway was performed by comparing the MDC of VOCs in groundwater to PRGs for indoor air. Where there are no exceedances of the volatilization PRGs, the indoor air inhalation pathway is assumed to be insignificant (Figure 9.5). Where there are exceedances of the volatilization PRGs, the potential for an exposure resulting in unacceptable risk to the WRW is assumed to exist and these locations require further evaluation in the FS.

While groundwater was not specifically evaluated in the ERA, the only exposure pathway for ecological receptors to groundwater is where groundwater impacts surface water. The surface water evaluation in the ERA indicated no significant impact to surface water for ecological receptors. Consequently, there are no significant impacts for ecological receptors from groundwater.

In conclusion, there are 10 groundwater AOIs associated with five areas of groundwater contamination that have potentially complete pathways to surface water. Where

reasonable, groundwater treatment systems have been installed within these areas of groundwater contamination. After completion of all accelerated actions and based on the complete pathways identified in Section 8.0, no other additional actions can reasonably be taken at this time. In addition, there are areas where exceedances of volatilization PRGs in groundwater indicate a potential indoor air risk.

#### 9.4 Surface Water

Eighteen surface water AOIs were identified in Section 5.0.<sup>3</sup> The AOIs are carbon tetrachloride, chloroform, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene, trichloroethene, vinyl chloride, dissolved aluminum, total beryllium, total chromium, total lead, total nickel, americium-241, gross alpha, gross beta, plutonium-239/240, uranium (sum of isotopes), and nitrate/nitrite (as N). No surface water COCs or ECOCs were identified in the CRA. The AEU assessments indicate that there are no continuing, significant risks to aquatic life from residual ECOPCs due to RFETS-related operations. However, additional surface water monitoring will be evaluated in the FS.

In Section 8.0, surface water AOI data were compared to surface water standards at representative surface water monitoring locations, including surface water Points of Compliance (POCs). Four surface water AOIs have been observed intermittently above the highest of the surface water standard, background, or PQL at representative (nonbackground) surface water locations. These AOIs are plutonium-239/240, americium-241, uranium (sum of isotopes), and nitrate/nitrite (as N). Americium-241 is observed intermittently above the surface water standard at surface water monitoring locations upstream of the terminal ponds in North Walnut Creek (SW093), South Walnut Creek (GS10), and the SID/Woman Creek drainage (GS51 and SW027). Plutonium-239/240 has been observed intermittently above the surface water standard at the same locations upstream from the terminal ponds as americium-241, as well as at station SW018 in the North Walnut Creek watershed. Uranium (sum of isotopes) was detected above the surface water standard in North Walnut Creek (GS13) and South Walnut Creek (GS10), although it is predominantly from natural uranium sources, based on analyses of uranium isotope fractions. Nitrate/nitrite (as N) was observed in North Walnut Creek (GS13) above the surface water standard. All other surface water AOIs are observed infrequently or not at all at concentrations above the highest of the surface water standard, background, or PQL at representative surface water locations.

For the most current data, no surface water AOIs exceed the surface water standards at any surface water POC or at the surface water monitoring location immediately upstream of the surface water POC for those surface water AOIs where data are not available at the surface water POC. However, surface water sample results do not always meet Colorado surface water quality standards for some analytes at some on-site monitoring locations upstream of the terminal ponds (see Table 8.3). Surface water leaving RFETS is acceptable for all uses.

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<sup>3</sup> Sediment AOIs are discussed with surface soil in Section 9.2.1.

## 9.5 Air

With the completion of accelerated actions under RFCA, sources of ongoing emissions to air include the following:

- Volatilization/release of VOCs from residual subsurface contamination and the closed landfills; and
- Resuspension of residual radioactive contaminants attached to surface soil particles.

However, as described in the site background section (Section 1.0), sources of VOC and radionuclide contamination were removed during accelerated actions conducted pursuant to RFCA. VOC emissions are rapidly decreasing and present no health or environmental concerns at present and anticipated future levels in ambient air.

Historic concentrations of airborne radionuclides were low relative to the applicable air emission standard (40 Code of Federal Regulations [CFR], Part 61, Subpart H). The total off-site annual effective dose equivalent (EDE) of combined radionuclides (americium-241, plutonium-239/240, uranium-233/234, uranium-235, and uranium-238) has been less than 3 percent of the allowable 10-mrem standard, based on samples collected since 1999. Subpart H monitoring is no longer required. No further evaluation for air is required in the FS.

## 9.6 Reconfiguration and Renaming of the Operable Units

In 2004, the RFCA Parties modified the 1996 Operable Unit (OU) Consolidation Plan in RFCA Attachment 1 to reduce the number of OUs that may need individual Corrective Action Decisions/Record of Decisions (CAD/RODs). Thus, there are two OUs: the IA OU and the Buffer Zone (BZ OU) (Section 1.0) that were evaluated in the RI.

Results of the RI analysis have identified the area of RFETS impacted by U.S. Department of Energy (DOE) activities. For purposes of this RI/FS Report, the OU boundaries are reconfigured to consolidate all areas of the site that may require final remedial actions into a final reconfigured OU. The boundary of this new “Central OU” also considers conveniences and practicalities of future land management. The remaining portions of the site have been consolidated into the reconfigured “Peripheral OU” (see Figure 9.6, Figure 9.7, and Figure 9.8).

The Peripheral OU has been determined to be unimpacted by site activities from a hazardous waste perspective; that is, no hazardous wastes or constituents have been placed in or migrated to the Peripheral OU. This determination is based on process knowledge including past waste management practices, research into evidence of disturbed areas (Appendix B), and results of extensive sampling in the BZ OU (Section 3.0). Historical Individual Hazardous Substance Sites (IHSSs), Potential Areas of Concern (PACs), and Potential Incidents of Concern (PICs) in the Peripheral OU are identified on Figure 9.9, and investigation results are summarized in Table 9.2.

A small portion of the Peripheral OU was impacted by site activities from a radiological perspective, for example, plutonium-239/240 exists above background in surface soil in the WBEU. As illustrated on Figure 9.10, there are a few sampling locations within the Peripheral OU that exceed a level of 9.8 picocuries per gram (pCi/g),<sup>4</sup> which corresponds to a  $1 \times 10^{-6}$  risk level for a WRW. Of these few sampling locations, the highest result is approximately 20 pCi/g. If the highest concentration of 20 pCi/g was considered the average concentration over an appropriate EU, it would correspond to a risk of approximately  $1 \times 10^{-5}$  for a rural resident, which would be in the middle of the CERCLA risk range ( $10^{-6}$  to  $10^{-4}$ ). These levels of radioactivity are also far below the 231-pCi/g activity level for an adult rural resident<sup>5</sup> that equates to the 25-mrem/y-dose criterion specified in the Colorado Standards for Protection Against Radiation (CDPHE 2005). Therefore, no action is required in the Peripheral OU and the Peripheral OU is determined to be acceptable for all uses from a radiological perspective. Further evaluation of the Peripheral OU is not required.

Figure 9.6 includes groundwater sampling locations where composite MCLs are exceeded in the Peripheral OU. Figure 9.7 includes subsurface soil sampling locations where volatilization PRGs are exceeded in the Peripheral OU. Figure 9.8 includes groundwater sampling locations where volatilization PRGs are exceeded in the Peripheral OU. Details on the analyte(s) causing the exceedance(s) at each location are discussed in Table 9.3. Further evaluation of these locations is not required.

No ECOCs were identified in the CRA for the Peripheral OU.

The Central OU boundary is intended for discussion purposes and may be refined throughout the CAD/ROD process. This reconfiguration and nomenclature are used throughout the remainder of the RI/FS Report.

## 9.7 Conclusions

Air emissions present no health or environmental concerns at present and anticipated future levels. Air will therefore not be evaluated in the FS.

Based on results of the RI, an FS is not required for the Peripheral OU. The RFCA Parties will propose a No Action CAD/ROD for the Peripheral OU.

Based on results of the RI, an FS is required for the Central OU. The underlying assumptions used in the CRA human health calculations will be embodied in an institutional control. The specific media to be evaluated in the FS are:

<sup>4</sup> The value 9.8 pCi/g is the plutonium-239/240 WRW PRG and is based on a target risk of  $1 \times 10^{-6}$  (see the Final CRA Methodology, DOE 2005a).

<sup>5</sup> Refer to the plutonium in surface soil target risk level in Table 1-1 of the Radionuclide Soil Action Levels (RSALs) Task 3 Report (EPA et al. 2002).

### Groundwater

- Five UHSU groundwater areas where contaminated groundwater may impact surface water;
- UHSU groundwater sampling locations where groundwater contamination exceeds MCLs; and
- Groundwater sampling locations where exceedances of volatilization PRGs in groundwater indicate a potential indoor air risk.

### Surface Water

- Surface water upstream of the terminal ponds where some surface water sample results do not always meet CWQCC surface water quality standards for some analytes; and
- Additional surface water monitoring to address uncertainties identified in the ERA.

### Soil

- Subsurface soil where complete pathways from subsurface soil to surface water (via groundwater) may impact surface water;
- Surface soil that may contribute to intermittent exceedances of the surface water standard for americium-241 and plutonium-239/240 upstream of the terminal ponds;
- Surface soil in the WBEU where results of the CRA indicate potential risk to a WRW is  $2 \times 10^{-6}$  for plutonium-239/240;
- Subsurface soil sampling locations where exceedances of volatilization PRGs in subsurface soil indicate a potential indoor air risk; and
- Additional ecological and sediment monitoring to address uncertainties identified in the ERA.

## **9.8 References**

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CDPHE, 2005, 6 CCR 1007-1, Part 4, Standards for Protection Against Radiation, Part 4.61, Radiological Criteria for License Termination, Hazardous Materials and Waste Management Division.

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DOE, 2005b, Interim Measure/Interim Remedial Action (IM/IRA) for Groundwater at the Rocky Flats Environmental Technology Site, Golden, Colorado, June.

EPA, 1989, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), USEPA OERR, Interim Final, USEPA/540/1-89/002, December.

EPA, 2003, The DNAPL Remediation Challenge: Is There a Case for Source Depletion? Expert Panel on DNAPL Remediation, Co-Chairs, Kavanaugh, M. and S., Rao, EPA/600/R-03/143.

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K-H, 2005b, Review of Historical Knowledge Related to Metals and Select Radionuclides Identified as Environmental Media Analytes of Interest, Rocky Flats Environmental Technology Site, Golden, Colorado, July.

NCP, 1990, Title 40 of the Code of Federal Regulations 300.430.

## **TABLES**

**Table 9.1**  
**Summary of the RFI/RI**

[illegible]

Table 9.1  
Summary of the RFI/RI

1 Nature and Extent AOIs					2 Risk Management Decisions and Conclusions of the CRA	3	4	5
Purpose: Characterize the nature of and threat posed by hazardous substances and hazardous materials and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions.					Purpose: Conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to groundwater or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain.	Results of Contaminant Fate and Transport	Results of RFI/RI	Areas in the Central OU to be Evaluated in the CMS/FS
						<p>are associated with one or more groundwater areas. Consequently, the subsurface soil AOIs with complete pathways from subsurface soil to surface water (via groundwater) may be above the surface water standard (which is higher than background or the PQL) at one or more Sentinel wells. At this time no other additional actions can reasonably be taken.</p> <p>For the subsurface AOIs, the most current data for those analytes measured in groundwater show concentrations below the highest of the surface water standard, background, or PQL at all AOC wells.</p>	<p>evaluated potential risk to the anticipated future user (WRW and WRV), the assumptions used in the WRW PRGs that correspond to this restricted land use scenario need to be embodied in an institutional control in the Central OU.</p> <p>The ERA did not identify significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination. However, additional ecological monitoring is required to address uncertainties identified in the ERA.</p>	
GROUNDWATER – Screened Against Surface Water Standards (Screening methodology, surface water standards screened against, and results are discussed in Section 4.0.)					Results are discussed in Section 7.0.	Results are discussed in Section 8.0.		
<div><div><div>UHSU</div><div><div>Radionuclides</div><div>Uranium (sum of isotopes)</div></div><div><div>VOCs</div><div>cis-1,2-Dichloroethene</div><div>1,2-Dichloroethane*</div><div>1,1-Dichloroethene</div><div>Benzene*</div><div>Carbon tetrachloride</div><div>Chloroform</div><div>Chloromethane*</div><div>Methylene chloride</div><div>Tetrachloroethene</div><div>Trichloroethene</div><div>Vinyl chloride</div></div><div><div>Metals</div><div>Arsenic (D)</div><div>Chromium (T)</div><div>Nickel (D)</div><div>Nickel (T)</div></div><div><div>Water Quality Parameters</div><div>Fluoride</div><div>Nitrate/Nitrite, as N</div><div>Sulfate</div></div></div><div><div>LHSU</div><div>None</div></div></div>					<p>While groundwater was not specifically evaluated in the ERA, the only exposure pathway for ecological receptors to groundwater is where groundwater impacts surface water. The surface water evaluation in the ERA indicated no significant impact to surface water for ecological receptors. Consequently, there are no significant impacts for ecological receptors from groundwater.</p> <p>Some subsurface sampling locations contain a complete groundwater/ subsurface soil-to-air pathway for a WRW. See Figures 9.3 and 9.5 for possible indoor air volatilization exposure areas.</p>	<p>Groundwater AOC and Sentinel wells were identified as locations to evaluate contaminated groundwater migration and the potential to impact surface water. Consequently, the Contaminant Fate and Transport section includes an evaluation of all groundwater AOIs at groundwater AOC and Sentinel wells against surface water standards.</p> <p>Groundwater contamination above MCLs exists in some sampling locations at RFETS (Figure 9.4).</p> <p>Five groundwater areas with the potential to impact surface water quality were identified because some groundwater AOIs are above surface water standards at one or more Sentinel wells:</p> <ul style="list-style-type: none"><li>• North of former Building 771;</li><li>• Historical East Trenches area (downgradient portion of plume);</li><li>• Historical Solar Evaporation Ponds (SEP) area and 700 Area Northeast area (downgradient portion of plume);</li><li>• Historical Mound Site and historical Oil Burn Pit No. 2 area (downgradient portion of plumes); and</li><li>• Historical 903 Pad and historical Ryan’s Pit area.</li></ul> <p>An accelerated action and/or enhancement was completed for each of these five areas under the Groundwater IM/IRA in 2005. At this time, no additional actions can reasonably be taken.</p>	<p>Groundwater contamination above MCLs exists in some sampling locations at RFETS (Figure 9.4).</p> <p>Five groundwater areas with the potential to impact surface water quality were identified because some groundwater AOIs are above surface water standards at some Sentinel wells. As part of the Groundwater IM/IRA, an alternatives analysis was conducted to evaluate accelerated action strategies that were feasible and practicable based on the type of residual contamination in these five plume areas and environmental conditions. The selected alternatives were conducted as one-time enhancements to previously implemented remedial actions. The enhancements were intended to reduce the migration of contaminated groundwater that could impact surface water quality. At this time, no additional actions can reasonably be taken.</p> <p>Three groundwater treatment systems were installed as accelerated actions under individual decision documents. Continued operation of the three groundwater actions serves to protect surface water quality over short- and intermediate-term periods by removing contaminant loading to surface water. This protection also serves to meet long-term goals for returning groundwater to its beneficial use of surface water protection. Each action is under ongoing performance monitoring consistent with</p>	<p>The three groundwater treatment systems will not be reevaluated in the FS. These actions will be carried forward as actions in an NFA Alternative (ETPTS, SPPTS, and MSPTS). At this time, no additional actions can reasonably be taken.</p> <p>Several areas in the Central OU will be evaluated in the CMS/FS as follows:</p> <ul style="list-style-type: none"><li>• Five UHSU groundwater areas where contaminated groundwater may impact surface water;</li><li>• UHSU groundwater monitoring locations where groundwater contamination exceeds MCLs; and</li><li>• Groundwater monitoring locations where exceedances of volatilization PRGs indicate a potential indoor air risk.</li></ul>

Table 9.1  
Summary of the RFI/RI

1	Nature and Extent AOIs			2	Risk Management Decisions and Conclusions of the CRA	3	4	5				
Purpose: Characterize the nature of and threat posed by hazardous substances and hazardous materials and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions.				Purpose: Conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to groundwater or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain.		Results of Contaminant Fate and Transport	Results of RFI/RI	Areas in the Central OU to be Evaluated in the CMS/FS				
						Three groundwater treatment systems were installed as accelerated actions under individual decision documents (ETPTS, SPPTS, and MSPTS). Continued operation of these three groundwater actions serves to protect surface water quality over short- and intermediate-term periods by removing contaminant loading to surface water.	groundwater and surface water monitoring required by the FY2005 IMP, Revision 1.  Groundwater contamination above MCLs exists in some areas of RFETS (Figure 9.4). An FS is not required for the protection of the environment due to groundwater contamination.					
SURFACE WATER – Screened Against Surface Water Standards (Screening methodology, surface water standards screened against, and results are discussed in Section 5.0.)				Results are discussed in Section 7.0.		Results are discussed in Section 8.0.						
<u>Radionuclides</u> Americium-241 Plutonium-239/240 Uranium (sum of isotopes) Gross alpha Gross beta		<u>VOCs</u> cis-1,2-Dichloroethene Carbon Tetrachloride Chloroform Methylene chloride Tetrachloroethene Trichloroethene Vinyl chloride	<u>Metals</u> Aluminum (D) Beryllium (T) Chromium (T) Lead (T) Nickel (T)	<u>Water Quality Parameters</u> Nitrate/Nitrite, as N		There is no significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination. However, additional surface water monitoring to address uncertainties identified in the ERA is needed.	For the most current data, no surface water AOIs exceed the surface water standards at any surface water POC or at the surface water monitoring location immediately upstream of the surface water POC for those surface water AOIs where data are not available at the surface water POC. However, surface water sample results do not always meet Colorado surface water quality standards for some analytes at some on-site monitoring locations upstream of the terminal ponds (see Table 8.3). Surface water leaving RFETS is acceptable for all uses.	No surface water AOIs exceed surface water standards at the surface water POCs or at the surface water monitoring location immediately upstream of the surface water POC if surface water AOI data are not available at the surface water POC.  Surface water sample results do not always meet Colorado surface water standards for some analytes at some on-site monitoring locations upstream of the terminal ponds.  The ERA did not identify significant risk of adverse ecological effects to receptors from exposure to site-related contamination. However, additional surface water monitoring is required to address uncertainties identified in the ERA.	The following areas/media in the Central OU will be evaluated in the CMS/FS:  • Areas where surface water upstream of the terminal ponds where some surface water sample results do not always meet Colorado surface water quality standards for some analytes will be evaluated in the CMS/FS. • Additional surface water monitoring to address uncertainties identified in the ERA.			
SEDIMENT – Screened Against WRW PRGs (Screening methodology, standards screened against, and results are discussed in Section 5.0.)				Results are discussed in Section 7.0.						Results are discussed in Section 8.0.		
<u>Radionuclides</u> Americium-241 Plutonium-239/240		<u>Metals</u> Arsenic Chromium	<u>SVOCs</u> Benzo(a)pyrene	There is no significant risk of adverse ecological effects to receptors from exposure to site-related residual contamination. However, additional sediment monitoring to address uncertainties identified in the ERA is needed.						Results of the contaminant fate and transport discussion are incorporated into the soil analysis above.	For human health, see the soil analysis above.  The ERA did not identify significant risk of adverse ecological effects to receptors from exposure to site-related contamination. However, additional sediment monitoring is required to address uncertainties identified in the ERA.	For human health, see the soil analysis above.  Additional sediment monitoring to address uncertainties identified in the ERA.

Table 9.1  
Summary of the RFI/RI

1	2	3	4	5
Nature and Extent AOIs	Risk Management Decisions and Conclusions of the CRA			
Purpose: Characterize the nature of and threat posed by hazardous substances and hazardous materials and gather data necessary to assess the extent to which the release poses a threat to human health or the environment or to support the analysis and design of potential response actions.	Purpose: Conduct a site-specific baseline risk assessment to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating to groundwater or surface water, releasing to air, leaching through soil, remaining in the soil, and bioaccumulating in the food chain.	Results of Contaminant Fate and Transport	Results of RFI/RI	Areas in the Central OU to be Evaluated in the CMS/FS
AIR – Screened Against Air Emission Standards (Screening methodology, standards screened against, and results are discussed in Section 6.0.)	Results are discussed in Section 7.0.	Results are discussed in Section 8.0.		
Radionuclides Americium-241 Plutonium-239/240 Uranium-233/234 Uranium-235 Uranium-238	See soil and groundwater discussion for results of the groundwater/subsurface soil-to-air pathway analysis.	The total off-site annual effective dose equivalent (EDE) of combined radionuclides has been less than 3 percent of the allowable 10 mrem/yr standard, based on samples collected since 1999.	For human health, see the soil and groundwater analysis above.  An FS is not required for the protection of the environment due to air.	None

VOCs = volatile organic compounds  
SVOCs = semi-volatile organic compounds  
PCBs = polychlorinated biphenyls  
\* = Indicates those AOIs that have a frequency of detection less than 1% above the designated standard.  
T = total metal  
D = dissolved metal

**Table 9.2**  
**Summary of Historical IHSSs, PACs, and PICs in the Peripheral OU**

<b>Historical Designation</b>	<b>Description</b>	<b>Investigation Results</b>	<b>No Further Action Determination</b>
IHSS 142.12 (PAC NE 142.12)	Flume Pond (downstream of terminal ponds, known as Pond A-5)	Pond A-5 is located immediately west and upstream of Indiana St. It is a flowthrough pond that generally retains several thousand gallons of Walnut Creek drainage water. This drainage received RFETS discharges throughout RFETS history. Characterization sample concentrations do not exceed the criteria in the CDPHE Conservative Risk-Based Screen, allowing unlimited use and unrestricted exposure. Surface sediment characterization sample concentrations do not exceed ecological screening levels (ESLs) and present a low risk to aquatic populations.	Data Summary Report dated 10/27/05 (AR# BZ-A-0000899) Approved 10/18/05 (AR# BZ A-000933)
IHSS 167.1 (PAC NE 167.1)	Landfill North Area Spray Field	Water from the Present Landfill (IHSS 114; PAC NW 114) leachate and surface runoff was collected in the east and west retention ponds. Spray evaporation used to prevent release of water from the ponds. IHSS 167.1 received spray between 1974 and 1981. Footing drain water collected from Buildings 771/774 was also sprinkled in this area. The HHRA results showed no adverse noncancer health effects and negligible cancer risk. The ERA showed negligible risks to the small mammal receptor group. Refer to the Final Phase I RFI/RI Report, Walnut Creek Priority Drainage, Operable Unit 6, Volume III, February, 1996. (AR# OU06-A-000455).	1997 Update to Historical Release Report (HRR) (AR# SW-A-002435) Approved 7/9/99 (AR# SW-A-004157)
IHSS 168 (PAC 000-168)	West Spray Field	Water from the SEP (IHSS 101; PAC 000-101) Ponds 207B North and 207B Center was spray-evaporated in IHSS 168 between 1982 and 1985. Characterization sample concentrations do not exceed the criteria in the CDPHE Conservative Risk-Based Screen, allowing unlimited use and unrestricted exposure. The screening-level ERA showed no significant adverse ecological effects. Refer to the OU 11 Final Combined Phases RFI/RI Report, June, 1995. (AR# OU11-A-000109).	OU 11 CAD/ROD dated September 1995 (AR# OU11-A-000184)
IHSS 195 (PAC NW 195)	Nickel Carbonyl Disposal	The contents of cylinders of nickel carbonyl were disposed in 1971 by placing them in a dry well and then venting them with small arms fire. Nickel carbonyl is highly flammable and reactive (small arms fire will ignite it) and evaporates rapidly. Two emptied cylinders could not be removed from the drywell and were buried. This disposal method resulted in oxidation of nickel carbonyl, leaving very low concentrations of insoluble nickel oxide. Model analysis demonstrates that an exposure pathway for nickel oxide does not exist. This area is not a source of nickel carbonyl and was determined to not present any unacceptable risk to human health or the environment. Refer to the Final No Further Action Justification Document, OU16, Low-Priority Sites, October, 1992 (AR# OU16-A-000015).	OU 16 CAD/ROD dated August 1994 (AR# OU16-A-000164)

**Table 9.2**  
**Summary of Historical IHSSs, PACs, and PICs in the Peripheral OU**

<b>Historical Designation</b>	<b>Description</b>	<b>Investigation Results</b>	<b>No Further Action Determination</b>
IHSS 209 (PAC SE 209)	Surface Disturbance Southeast of Building 881	This area was formerly a gravel borrow pit used in 1955 for construction activities. An area encompassing this IHSS and a surface disturbance 1,500 ft west of IHSS 209 were investigated to determine whether they may have been used as a disposal area. Characterization sample concentrations did not exceed the background mean plus two standard deviations criteria in the CDPHE Conservative Risk-Based Screen, with the possible exception of mercury in one surface soil sample, and the areas were excluded from further human health risk evaluation. Also, the ERA for the Woman Creek Watershed did not indicate that IHSS 209 was a source area. Refer to the Final Phase I RFI/RI Report, Woman Creek Priority Drainage, Operable Unit 5, April, 1996 (AR#OU05-A-000594).	1997 Update to HRR (AR# SW-A-002435) Approved 7/9/99 (AR# SW-A-004157)
PAC 000-501	Roadway Spraying	Waste oil, brine solution, and footing drain water were occasionally sprayed on unpaved roads in the BZ for dust suppression. Last spraying was in 1983. It is improbable that those contaminants from waste oil/brine would still be present. Refer to the letter, dated December 23, 1992, from M. Hestmark, EPA, to R. Schassburger, DOE (AR#OU2A-000672).	1992 HRR (AR# SW-A-000378 and -000379) Approved 2/14/02 (AR# SW-A-004766)
PAC 100-604	T130 Complex Sewer Line Leaks	Leaking sanitary sewer lines from Office Trailers (subsequently repaired) were determined not likely to contain any impacting contamination. Refer to the letter, dated December 23, 1992, from M. Hestmark, EPA, to R. Schassburger, DOE (AR# OU2A-000672).	1992 HRR (AR# SW-A-000378 and -000379) Approved 2/14/02 (AR# SW-A-004766)
PAC NE 1400	Tear Gas Powder Release	Five pounds of CS tear gas powder spilled on the roadway was hosed down by RFETS Fire Department personnel. The cleanup action was considered sufficient for this release. Refer to the letter, dated December 23, 1992, from M. Hestmark, EPA, to R. Schassburger, DOE (AR# OU2A-000672).	1992 HRR (AR# SW-A-000378 and -000379) Approved 2/14/02 (AR# SW-A-004766)
PAC NE 1403	Gasoline Spill – Building 920 Guard Post	One quart of gasoline spilled onto the parking lot. The spill was contained with oil dry and removed. The cleanup action was considered sufficient for this release. Refer to the letter, dated December 23, 1992, from M. Hestmark, EPA, to R. Schassburger, DOE (AR# OU2A-000672).	1992 HRR (AR# SW-A-000378 and -000379) Approved 2/14/02 (AR# SW-A-004766)
PAC SE 1601.2	Pond 8 - South (Cooling Tower Discharge Releases)	Pond 8 - south was constructed before October 1964 to receive Building 881 cooling tower water discharges. The pond may have also collected Building 881 footing drain water. It was used until the mid 1970s. The RFCA Parties working group reviewed location information and soil sampling results in an April 3, 2002, meeting. Using the consultative process, it was determined that OU 1 did not impact this area.	1992 HRR (AR# SW-A-000378 and -000379) Approved 9/26/02 (AR# BZ-A-000557)

**Table 9.2**  
**Summary of Historical IHSSs, PACs, and PICs in the Peripheral OU**

<b>Historical Designation</b>	<b>Description</b>	<b>Investigation Results</b>	<b>No Further Action Determination</b>
PAC SW 1700	Fuel Spill – Woman Creek Drainage	An armored vehicle accidentally overturned and fuel from the fuel tank leaked into the creek on October 19, 1973. The vehicle was righted and removed from the area. Because of the time elapsed since the spill, the fuel has degraded and is no longer a concern. Refer to the letter, dated December 23, 1992, from M. Hestmark, EPA, to R. Schassburger, DOE (AR#OU2A-000672).	1992 HRR (AR# SW-A-000378 and -000379) Approved 2/14/02 (AR# SW-A-004766)
PIC 23	Antifreeze Leak – Building 123 Parking Lot	Approximately 2 gallons of automobile antifreeze spilled on the asphalt in 1991 and was cleaned up by the RFETS HAZMAT team. The RFCA Parties working group reviewed information related to this PIC in an April 3, 2002, meeting. Using the consultative process, it was determined the spill was on an asphalt surface, was cleaned up, and is not likely to impact soil or surface water.	1992 HRR (AR# SW-A-000378 and -000379) Approved 9/26/02 (AR# BZ-A-000557)
PIC 33	Gasoline Leak – T130 Parking Lot	Approximately 0.5 gallon of gasoline spilled on the asphalt in 1991 and was cleaned up by the RFETS HAZMAT team. The RFCA Parties working group reviewed information related to this PIC in an April 3, 2002, meeting. Using the consultative process, it was determined the spill was on an asphalt surface, was cleaned up, and is not likely to impact soil or surface water.	1992 HRR (AR# SW-A-000378 and -000379) Approved 9/26/02 (AR# BZ-A-000557)

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
<b>UHSU Groundwater Sampling Locations Where Composite MCLs Were Exceeded</b>					
Well 0286 (installed in 1986)	Near the eastern site boundary and south of Kestrel Gulch	Total Chromium	248 µg/L	100 µg/L	With the presence of both chromium and nickel in this well, the concentration of chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There are two detected concentrations of chromium in this well (both occurring in 1992 and closely matching the nickel concentrations), since it was installed in 1986. The first detected concentration of chromium was below the MCL.
		Total Nickel	219 µg/L	140 µg/L	With the presence of both chromium and nickel in this well, the concentration of nickel observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding nickel. There are two detected concentrations of nickel in this well (both occurring in 1992 and closely matching the chromium concentrations), since it was installed in 1986. The first detected concentration of nickel was below the MCL.
Well 0486 (installed in 1986)	Near eastern site boundary, just southeast of the Flume Pond	Total Chromium	157 µg/L	100 µg/L	A chromic acid spill occurred from the former Building 444 basement and was contained in the B-Ponds and then pumped to Upper Church Ditch where it was below surface water standards. This well is located north of former Building 444 and north of Upper Church Ditch. A portion of the chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There are six detected concentrations of chromium in this well, since it was installed in 1986, with the highest concentration detected in 1992, which is the most recent concentration.

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
		Fluoride	5,500 µg/L	4,000 µg/L	Fluoride or fluorite was not identified in the ChemRisk Task 1 report as a chemical in inventory at RFETS (K-H 2005bb). See Section 8.0 for additional information regarding fluoride. There are only two detected concentrations for fluoride in this well (detected in 1992) since it was installed in 1986.
Well 0686 (installed in 1986)	North-central portion of the BZ OU, east of the Landfill Pond in No Name Gulch stream segment	Total Chromium	565 µg/L	100 µg/L	A chromic acid spill occurred from the former Building 444 basement and was contained in the B-Ponds and then pumped to Upper Church Ditch where it was below surface water standards. This well is located in No Name Gulch downgradient from the Present Landfill, northeast of former Building 444, and east of Upper Church Ditch. A portion of the chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There is only one detected concentration of chromium (in 1992) in this well, since it was installed in 1986.
		Total Nickel	211 µg/L	140 µg/L	Nickel plating was conducted in the former 700 Area of the site (K-H 2005b). This well is located north of the former 700 Area. A portion of the nickel observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding nickel. There is only one detected concentration (in 1992) of nickel in this well, since it was installed in 1986.
Well 5386 (installed in 1986 and abandoned in 8/02)	Southwestern portion of the BZ OU near the site boundary, in Owl Branch stream segment	Nitrate/Nitrite as N	31,977 µg/L	10,000 µg/L	Nitrate/nitrite is naturally occurring in soil, surface water, and groundwater. This location is not part of the on-site nitrate groundwater plume located in the area of the historical SEP. See Section 8.0 for specific information regarding nitrate/nitrite. There are three detected concentrations of nitrate/nitrite in this well, since it was installed in 1986, with the highest concentration detected in 1995, which is the most recent concentration. Two of the

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
					three detected concentrations were orders of magnitude below the MCL.
Well 5686 (installed in Well 1986 and abandoned in 11/04)	Southeastern portion of the BZ OU, at the junction of Owl Branch and Woman Creek stream segments	Total Chromium	1100 µg/L	100 µg/L	A chromic acid spill occurred from the former Building 444 basement and was contained in the B-Ponds and then pumped to Upper Church Ditch where it was below surface water standards. This well is located southwest of former Building 444 and Upper Church Ditch in Mower Ditch. A portion of the chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There are seven detected concentrations of chromium in this well, since it was installed in 1986, with the highest concentration detected in 2001, which is also the most recent. Four of the seven concentrations were at or below the MCL. This well was abandoned in 2004.
Well 6486 (installed in 1986)	Southern portion of the BZ OU, west of Pond C-1	Dissolved Nickel	1160 µg/L	140 µg/L	Nickel plating was conducted in the former 700 Area of the site (K-H 2005b). This well is located southeast of the former 700 Area. A portion of the nickel observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding nickel. There are 14 detected concentrations of nickel in this well, since it was installed in 1986, with the highest concentration detected in 2002. The most recent concentration (detected in 2004) was below the highest detected concentration. Seven of the 14 detected concentrations were below the MCL.
Well 6686 (installed in 1986 and abandoned in 9/04)	Southeastern portion of the BZ OU, in Mower Ditch	Total Chromium	138 µg/L	100 µg/L	A chromic acid spill occurred from the former Building 444 basement and was contained in the B-Ponds and then pumped to Upper Church Ditch where it was below surface water standards. This well is located southeast of former Building 444 and Upper Church Ditch in Mower Ditch. A portion of the chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
					well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There are six detected concentrations of chromium in this well, since it was installed in 1986, with the highest concentration detected in 1992. This most recent concentration (collected in 1992) was below the highest concentration detected, also in 1992. Four of the six concentrations were below the MCL. This well was abandoned in 2004.
Well 10394 (installed in 1994)	Near the eastern site boundary, in the southeastern portion of the site, in Mower Ditch	Total Nickel	400 µg/L	140 µg/L	Nickel plating was conducted in the former 700 Area of the site (K-H 2005b). This well is located southeast of the former 700 Area. A portion of the nickel observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding nickel. There are nine detected concentrations of nickel in this well, since it was installed in 1994, with the highest concentration detected in 2003, which is the most recent concentration. Eight of the nine detected concentrations were an order of magnitude below the MCL.
Well 11694 (installed in 1994 and abandoned in 1/03)	North-central portion of the BZ OU, north of Upper Church Ditch and southeast of Grape Draw stream	Total Nickel	233 µg/L	140 µg/L	Nickel plating was conducted in the former 700 Area of the site (K-H 2005b). This well is located north of the former 700 Area. A portion of the nickel observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding nickel. There is only one detected concentration (in 1994) of nickel in this well, since it was installed in 1994 and abandoned in 2003.
		Total Chromium	179 µg/L	100 µg/L	A chromic acid spill occurred from the former Building 444 basement and was contained in the B-Ponds and then pumped to Upper Church Ditch where it was below surface water standards. This well is located north of former Building 444 and north of Upper Church Ditch. A portion of the chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
					stabilizers. See Section 8.0 for additional information regarding chromium. There is only one detected concentration of chromium (in 1994) in this well, since it was installed in 1994 and abandoned in 2003.
Well 11794 (installed in 1994 and abandoned in 1/03)	North-central portion of the BZ OU, north of Upper Church Ditch and southeast of Grape Draw stream. Located in the same area as well 11694.	Total Chromium	110 µg/L	100 µg/L	A chromic acid spill occurred from the former Building 444 basement and was contained in the B-Ponds and then pumped to Upper Church Ditch where it was below surface water standards. This well is located north of former Building 444 and north of Upper Church Ditch. A portion of the chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There is only one detected concentration of chromium (in 1994) in this well, since it was installed in 1994 and abandoned in 2003.
Well 41091 (installed in 1991 and abandoned in 6/05)	Northeastern portion of the BZ OU and just northeast of Pond A-4	Total Chromium	147 µg/L	100 µg/L	With the presence of both chromium and nickel in this well, the concentration of chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There are eight detected concentrations of chromium in this well (closely matching the nickel concentrations), since it was installed in 1991, with the highest concentration detected in 1995, which is the most recent concentration. Seven of the eight detected concentrations were an order of magnitude below the MCL. This well was abandoned in 2003.
		Total Nickel	158 µg/L	140 µg/L	With the presence of both chromium and nickel in this well, the concentration of nickel observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding nickel. There are eight detected concentrations of nickel in this well (closely matching the chromium concentrations), since it was installed in 1991, with the highest concentration detected in 1995, which is the

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
					most recent concentration. Seven of the eight detected concentrations were an order of magnitude below the MCL. This well was abandoned in 2005.
Well 50794 (installed in 1994 and abandoned in 7/02)	Southwestern portion of the BZ OU near the site boundary, north of Woman Creek	Nitrate/Nitrite as N	14,100 µg/L	10,000 µg/L	Nitrate/nitrite is naturally occurring in soil, surface water, and groundwater. This location is not part of the on-site nitrate groundwater plume located in the area of the historical SEP. See Section 8.0 for specific information regarding nitrate/nitrite. There are four detected concentrations of nitrate/nitrite in this well, since it was installed in 1994, with the highest concentration detected in 1995, which is the most recent concentration. Three of the four detected concentrations were at or below the MCL.
Well 51594 (installed in 1994 and abandoned in 7/02)	Western portion of the BZ OU, south of McKay Ditch	Nitrate/Nitrite as N	15,100 µg/L	10,000 µg/L	Nitrate/nitrite is naturally occurring in soil, surface water and groundwater. This location is not part of the on-site nitrate groundwater plume located in the area of the historical SEP. See Section 8.0 for specific information regarding nitrate/nitrite. There are four detected concentrations of nitrate/nitrite in this well, since it was installed in 1994, with the highest concentration detected in 1995, which is the most recent concentration. Two of the four detected concentrations were below the MCL.
Well 63895 (installed in 1995 and abandoned in 9/02)	Northwestern portion of the BZ OU, southwest of Lindsay 1 Pond	Tetrachloroethene	15.8 µg/L	5 µg/L	Tetrachloroethene was used at RFETS. See Section 8.0 for specific information regarding tetrachloroethene. There is only one detected concentration of tetrachloroethene (in 2002) since the well was installed in 1995 and abandoned in 2002.
Well 77192 (installed in 1992 and abandoned in 8/04)	North-central portion of the BZ OU, north of East Landfill Pond	Fluoride	6,070 µg/L	4,000 µg/L	Fluoride or fluorite was not identified in the ChemRisk Task 1 report as a chemical in inventory at RFETS (K-H 2005b). See Section 8.0 for additional information regarding fluoride. There is only one detected concentration for fluoride in this well (detected in 1995), since it was installed in 1992 and abandoned in 2004.

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
Well B201189 (installed in 1989 and abandoned in 10/02)	Near northern site boundary, just east of Gentian Draw stream	Total Nickel	334 µg/L	140 µg/L	With the presence of both chromium and nickel in this well, the concentration of nickel observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding nickel. There are six detected concentrations of nickel in this well (closely matching the chromium concentrations), since it was installed in 1989, with the highest concentration detected in 1992, which is the most recent concentration. Five of the six detected concentrations were orders of magnitude below the MCL.
		Total Chromium	729 µg/L	100 µg/L	With the presence of both chromium and nickel in this well, the concentration of chromium observed in groundwater may be attributable to stainless-steel well casings, pump parts, and well tubing stabilizers. See Section 8.0 for additional information regarding chromium. There are six detected concentrations of chromium in this well (closely matching the nickel concentrations) since it was installed in 1989, with the highest concentration detected in 1992, which is also the most recent concentration. Five of the six detected concentrations were orders of magnitude below the MCL.
Well B201289 (installed in 1989 and abandoned in 10/02)	Near northern site boundary, just north of Lindsay Branch stream	Nitrate/Nitrite as N	11,000 µg/L	10,000 µg/L	Nitrate/nitrite is naturally occurring in soil, surface water, and groundwater. See Section 8.0 for specific information regarding nitrate/nitrite. This location is not part of the on-site nitrate groundwater plume located in the area of the historical SEP. There are seven detected concentrations of nitrate/nitrite in this well, since it was installed in 1989, with the highest concentration detected in 1991. This most recent concentration for nitrate/nitrite (detected in 1993) is lower than the concentration detected in 1991.

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

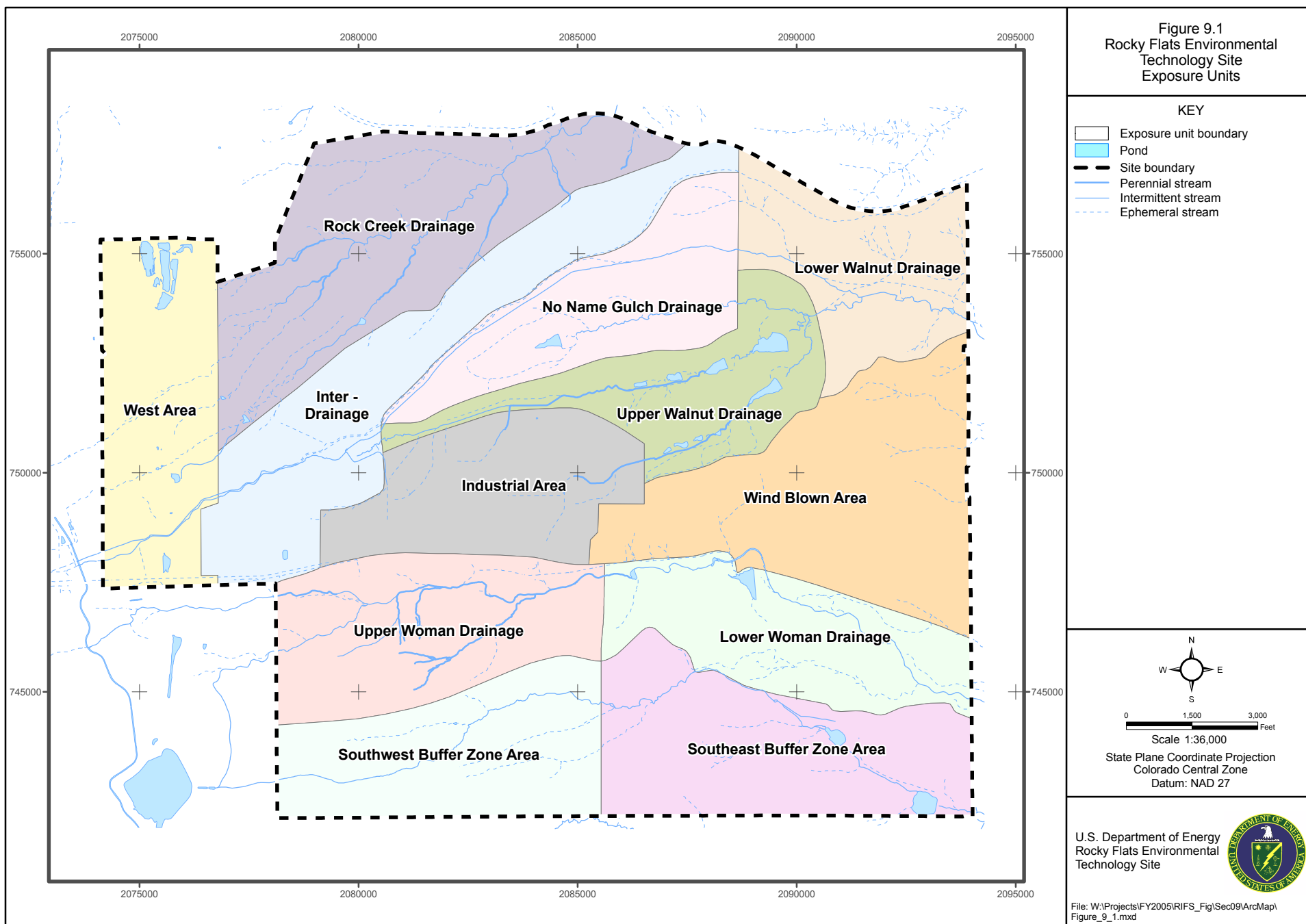
Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
Well B206989 (installed in 1989)	East of the East Landfill Pond at the headwaters to No Name Gulch stream	Nitrate/Nitrite as N	28,000 µg/L	10,000 µg/L	Nitrate/nitrite is naturally occurring in soil, surface water and groundwater. This location is not part of the on-site nitrate groundwater plume located in the area of the historical SEP. See Section 8.0 for specific information regarding nitrate/nitrite. There are 32 detected concentrations of nitrate/nitrite in this well, since it was installed in 1989, with the highest concentration detected in 1992. This most recent concentration for nitrate/nitrite (detected in 2005) is lower than the concentration detected in 1992. This well is located downstream from the Present Landfill.
Well B303089 (installed in 1989)	Near the eastern and southern corner of the site boundary	Fluoride	7,200 µg/L	4,000 µg/L	Fluoride or fluorite was not identified in the ChemRisk Task 1 report as a chemical in inventory at RFETS (K-H 2005b). See Section 8.0 for additional information regarding fluoride. There are eight detected concentrations of fluoride in this well, since it was installed in 1989, with the highest concentration detected in 1991. This most recent concentration for fluoride (detected in 1995) is lower than the concentration detected in 1991.
<b>Subsurface Soil Sampling Locations Where Volatilization PRGs Were Exceeded</b>					
46392	Located within the Inter-Drainage EU (IDEU) and is located further north	Chloroform	96 µg/kg	47.1 µg/kg	The maximum detected concentration (collected in 1992) is the same order of magnitude as the volatilization PRG. This sample was collected from an unusually large depth interval (0-60 ft), and almost all of the analytical data for the sample were either rejected ("R" qualified) or estimated ("J" qualified). Thirty-two of the results were rejected and two were designated as estimated. Chloroform was one of the two J-qualified analytical results. A second sample was collected beneath the above described sample, also at an unusually large depth interval (61-102 ft). The concentration of chloroform (6 µg/kg) at this depth interval was below the volatilization PRG and slightly above the detection limit (5 µg/kg). Volatilization risks from chloroform are considered

**Table 9.3**  
**Groundwater Monitoring Locations Where MCLs or PRGs Were Exceeded Inside the Peripheral OU**

Location	Description	Analyte	Concentration	MCL or PRG <sup>a</sup>	Discussion
					negligible since the concentration is only slightly higher than the PRG.
51494	Located within the IDEU farther south	Mercury	25.4 mg/kg	9.47 mg/kg	The maximum detected concentration (collected in 1994) is approximately twice the volatilization PRG. Fourteen subsurface soil samples were collected at this location to a depth of 60 ft in approximately 2-to-6 ft intervals. All of the samples (with the exception of this sample at the 4-to-6 ft depth interval) had concentrations of mercury at or below the detection limit (0.1 mg/kg). Because the volatilization PRG is based on a HQ of 0.1, the HQ estimate for mercury would be approximately 0.2. An HQ of 1 is considered to be protective of human populations, including sensitive subgroups.

<sup>a</sup> The PRGs identified here are the volatilization PRGs as identified in Appendix A, Volume 2, Attachment 4.

## **FIGURES**



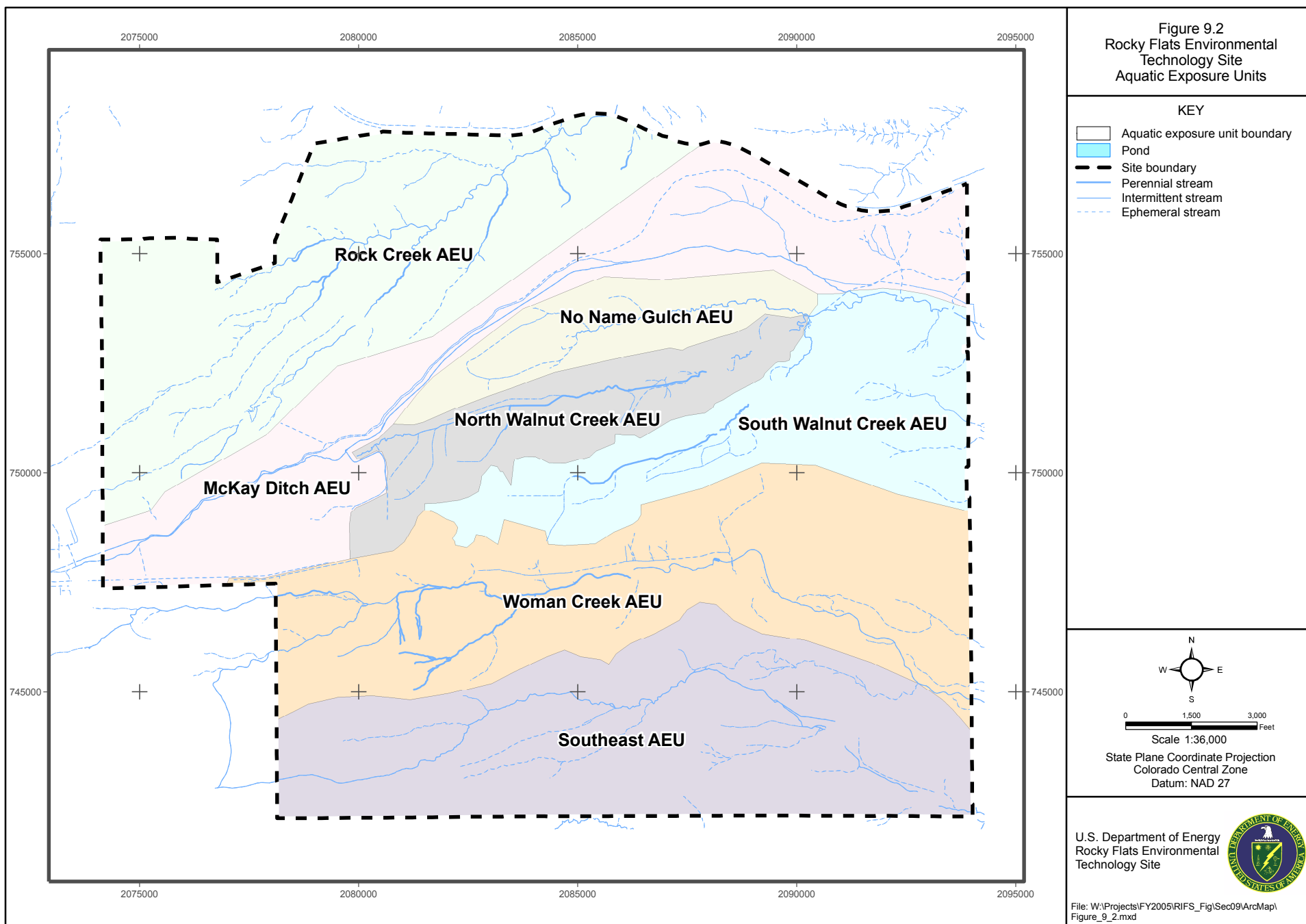


Figure 9.3

Subsurface Soil Sampling  
Locations Where Volatilization  
PRGs Were Exceeded

KEY

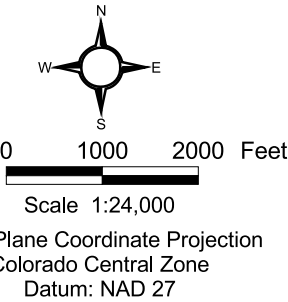
- Exceeded volatilization PRGs
  - Did not exceed volatilization PRGs
- A location is classified as a PRG exceedance if any analyte was detected at a concentration exceeding its PRG since June 28, 1991.

Standard Map Features

- IA OU boundary
- Site boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

Exposure Units

- Industrial Area
- Inter-Drainage
- Lower Walnut Drainage
- Lower Woman Drainage
- No Name Gulch Drainage
- Rock Creek Drainage
- Southeast Buffer Zone Area
- Southwest Buffer Zone Area
- Upper Walnut Drainage
- Upper Woman Drainage
- West Area
- Wind Blown Area



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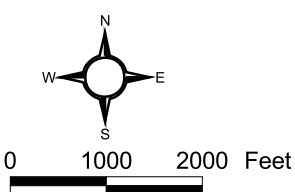
**Figure 9.4**  
**UHSU Groundwater Monitoring**  
**Locations Where Composite**  
**MCLs Were Exceeded**

**KEY**

- Sample collected since January 1, 2000
- Sample collected between January 1, 1995 and December 31, 1999
- △ Sample collected between June 28, 1991 and December 31, 1994
- Concentration > MCL
- Concentration ≤ MCL

**Standard Map Features**

- IA OU boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary



Scale 1:24,000  
State Plane Coordinate Projection  
Colorado Central Zone  
Datum: NAD 27

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Rocky Flats Environmental  
Technology Site

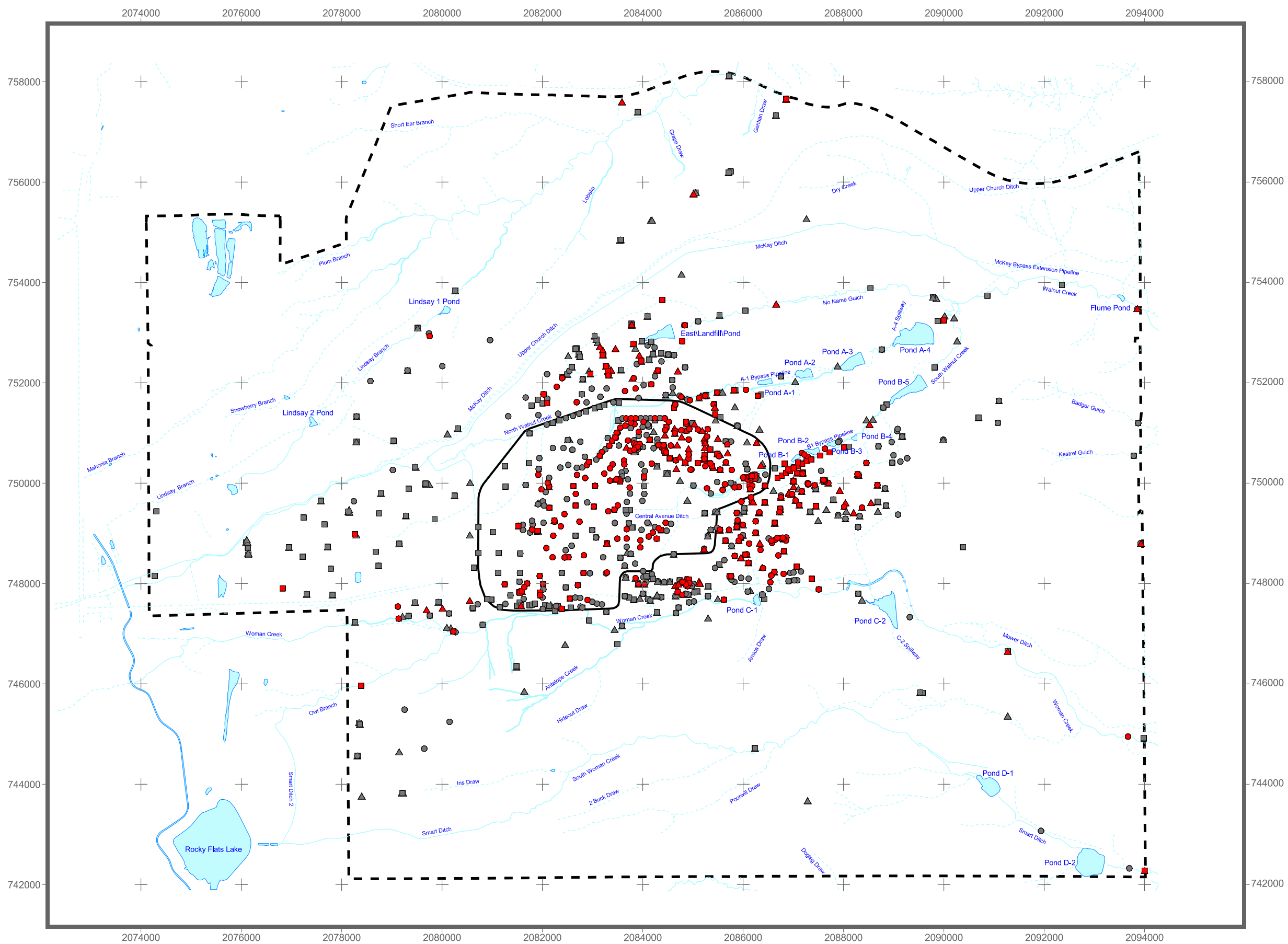


Figure 9.5

Groundwater Sampling Locations  
Where Volatilization PRGs  
Were Exceeded

KEY

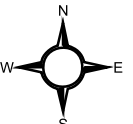
- Exceeded volatilization PRGs
  - Did not exceed volatilization PRGs
- A location is classified as a PRG exceedance if any analyte was detected at a concentration exceeding its PRG since June 28, 1991.

Standard Map Features

- IA OU boundary
- Site boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

Exposure Units

- Industrial Area
- Inter-Drainage
- Lower Walnut Drainage
- Lower Woman Drainage
- No Name Gulch Drainage
- Rock Creek Drainage
- Southeast Buffer Zone Area
- Southwest Buffer Zone Area
- Upper Walnut Drainage
- Upper Woman Drainage
- West Area
- Wind Blown Area



0 1000 2000 Feet

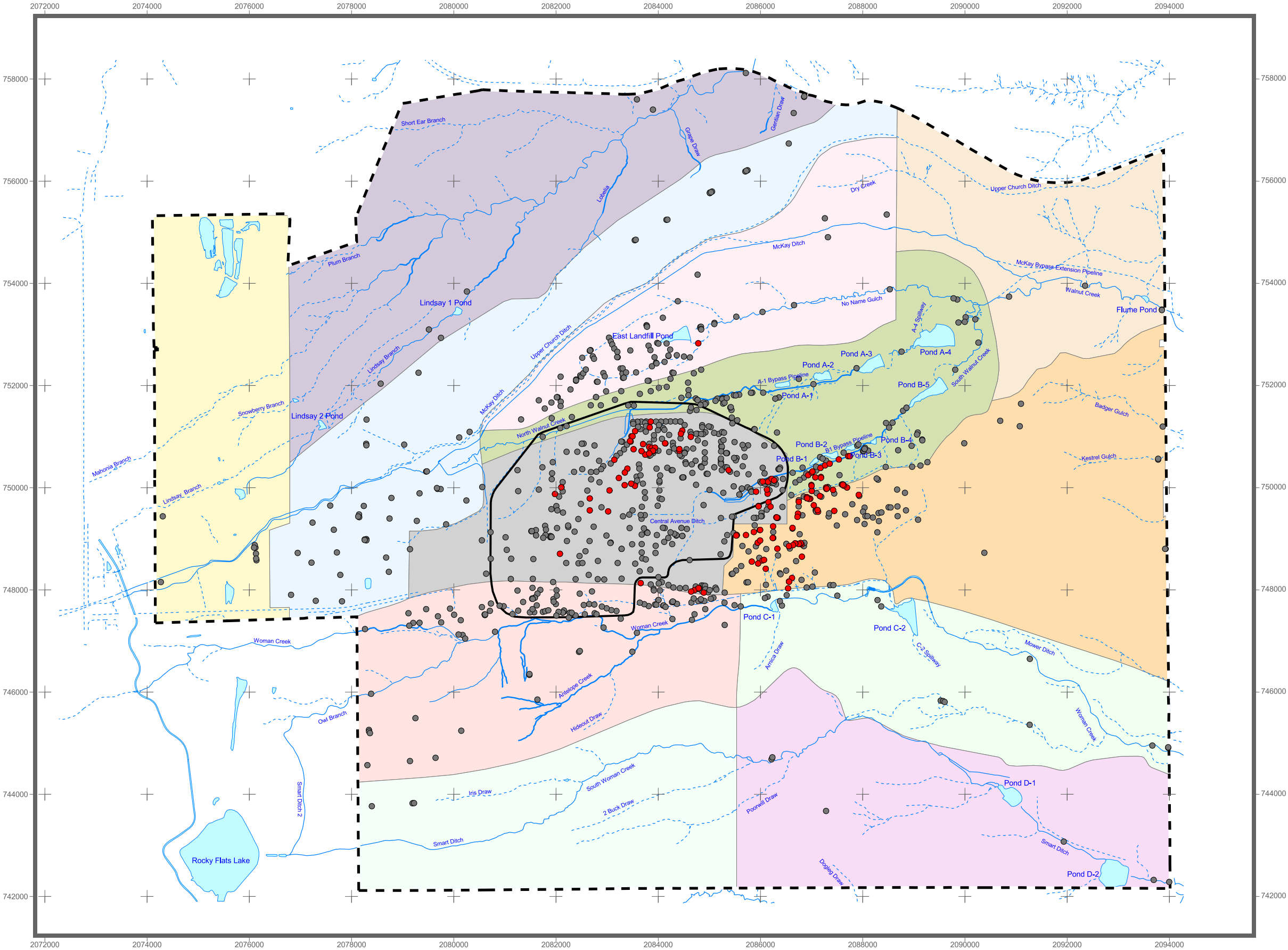
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Datum: NAD 27

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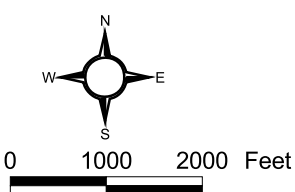
**Figure 9.6**  
**UHSU Groundwater Monitoring**  
**Locations Where Composite**  
**MCLs Were Exceeded**

**KEY**

- Sample collected since January 1, 2000
- Sample collected between January 1, 1995 and December 31, 1999
- △ Sample collected between June 28, 1991 and December 31, 1994
- Concentration > MCL
- Concentration ≤ MCL

**Standard Map Features**

- Central OU boundary
- IA OU boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary



Scale 1:24,000  
State Plane Coordinate Projection  
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Datum: NAD 27

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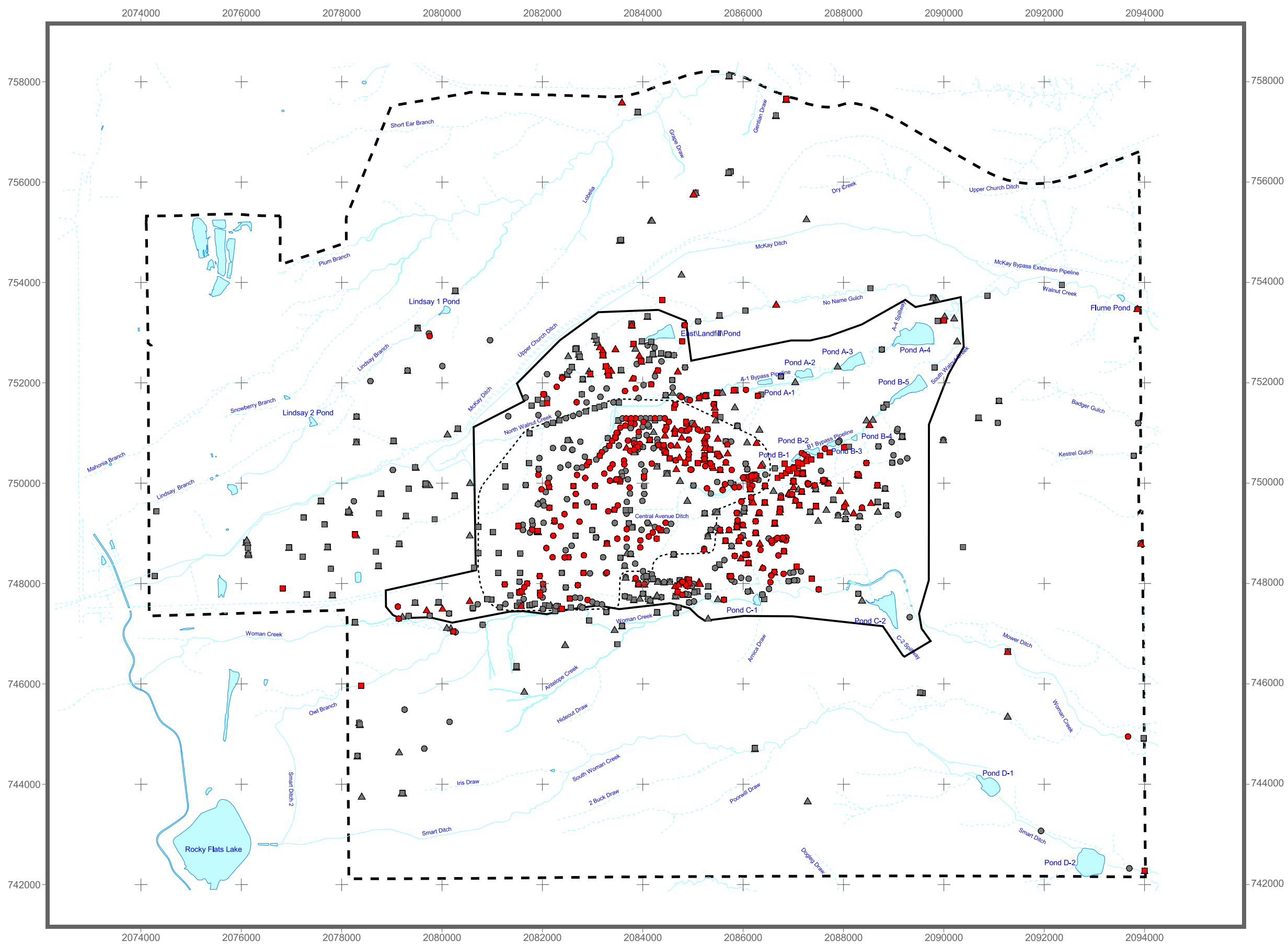


Figure 9.7

Subsurface Soil Sampling  
Locations Where Volatilization  
PRGs Were Exceeded

KEY

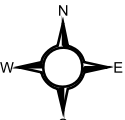
- Exceeded volatilization PRGs
  - Did not exceed volatilization PRGs
- A location is classified as a PRG exceedance if any analyte was detected at a concentration exceeding its PRG since June 28, 1991.

Standard Map Features

- Central OU boundary
- IA OU boundary
- Site boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

Exposure Units

- Industrial Area
- Inter-Drainage
- Lower Walnut Drainage
- Lower Woman Drainage
- No Name Gulch Drainage
- Rock Creek Drainage
- Southeast Buffer Zone Area
- Southwest Buffer Zone Area
- Upper Walnut Drainage
- Upper Woman Drainage
- West Area
- Wind Blown Area



0 1000 2000 Feet

Scale 1:24,000

State Plane Coordinate Projection  
Colorado Central Zone  
Datum: NAD 27

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Figure 9.8

Groundwater Sampling Locations  
Where Volatilization PRGs  
Were Exceeded

KEY

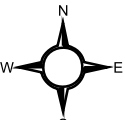
- Exceeded volatilization PRGs
  - Did not exceed volatilization PRGs
- A location is classified as a PRG exceedance if any analyte was detected at a concentration exceeding its PRG since June 28, 1991.

Standard Map Features

- Central OU boundary
- IA OU boundary
- Site boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream

Exposure Units

- Industrial Area
- Inter-Drainage
- Lower Walnut Drainage
- Lower Woman Drainage
- No Name Gulch Drainage
- Rock Creek Drainage
- Southeast Buffer Zone Area
- Southwest Buffer Zone Area
- Upper Walnut Drainage
- Upper Woman Drainage
- West Area
- Wind Blown Area



0 1000 2000 Feet

Scale 1:24,000

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Colorado Central Zone  
Datum: NAD 27

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Figure 9.9

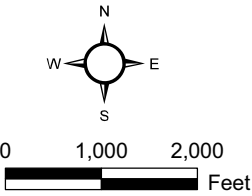
Historical IHSSs, PACs, and  
PICs in the Peripheral OU

KEY

- Historical PIC
- - - IA OU boundary
- - - Historical IHSS and PAC areas
- ▬ Proposed Central OU boundary
- Historical HRR area

Standard Map Features

- ▬ Pond
- - - Site boundary
- ▬ Perennial stream
- ▬ Intermittent stream
- ▬ Ephemeral stream

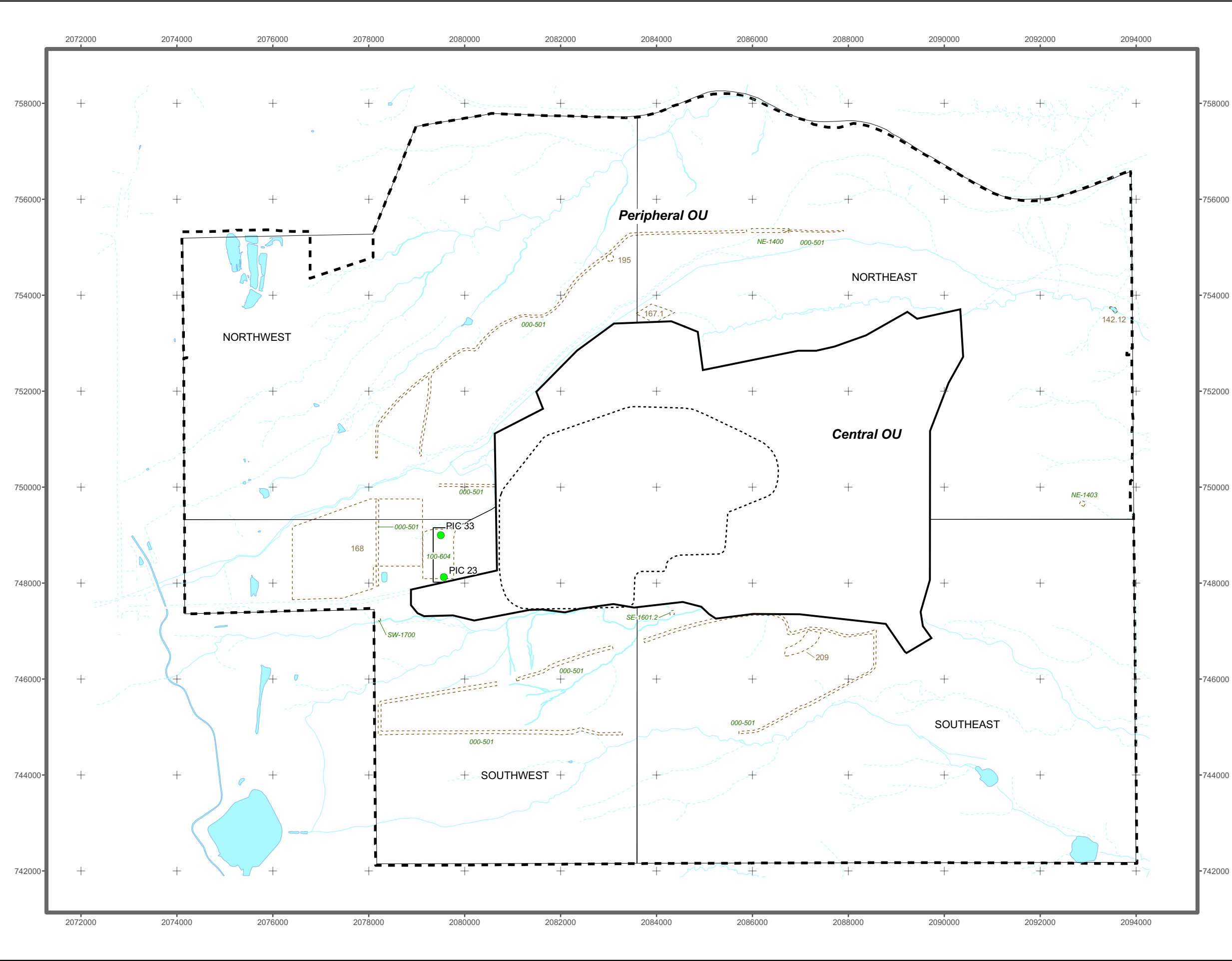


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**Figure 9.10**  
**Plutonium-239/240**  
**Activity in**  
**Surface Soil**

**KEY**

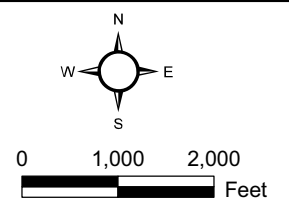
- > OR = WRW PRG
- > Background AND < WRW PRG
- Detected AND < OR = Background
- Not detected

Minimum nondetect reported value = -0.078 pCi/g  
Maximum nondetect reported value = 0.218 pCi/g  
Background M2SD = 0.066 pCi/g  
WRW PRG = 9.8 pCi/g

Notes:  
- Data presented are the results from soil samples collected from 6/28/1991 through 8/22/2005.  
- See Summary Table 3.13 for additional information.

**Standard Map Features**

- Central OU boundary
- IA OU boundary
- Pond
- Perennial stream
- Intermittent stream
- Ephemeral stream
- Site boundary



Scale 1:24,000  
State Plane Coordinate Projection  
Colorado Central Zone  
Datum: NAD 27

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